Compound Interest

Practice set 14.1

Q. 1. Find the amount and the compound interest.

No.	Principal (₹)	Rate (p.c.p.a.)	Duration (years)
1	2000	5	2
2	5000	8	3
3	4000	7.5	2

Answer : (a) Principal = 2000/-, Rate = 5% (p.c.p.a), Duration (n) = 2 years

$\because A = P\left(1+\frac{R}{100}\right)^n$

$\therefore A = 2000\left(1+\frac{5}{100}\right)_2$

$A = 2000\ (1+0.05)^2$

$A = 2000\ (1.05)^2$

$A = 2000\ (1.1025)$

$\therefore A = 2205/-$

$\therefore C.I = A - P$

$\therefore C.I = 2205 - 2000$

C.I. = 205/-

∴ Amount is 2205/- and Compound interest is 205/- .

b. Principal = 5000/-, Rate = 8% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 5000\left(1 + \frac{8}{100}\right)_3$$

$A = 5000\ (1 + 0.08)^3$

$A = 5000\ (1.08)^3$

$A = 5000\ (1.259712)$

∴ A= 6298.56/-

∵ C.I. = A - P

∴ C.I. = 6298.56 - 5000

C.I. = 1298.56/-

∴ Amount is 6298.56/- and Compound interest is 1298.56/- .

c. Principal = 4000/-, Rate = 7.5% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

∴ $A = 4000\ (1 + 0.075)^2$

$A = 4000\ (1.075)^2$

$A = 4000\ (1.155625)$

∴ A= 4622.5/-

∵ C.I. = A - P

∴ C.I. = 4622.5 - 4000

C.I. = 622.5/-

∴ Amount is 4622.5/- and Compound interest is 622.5/- .

Q. 2. Sameerrao has taken a loan of ₹ 12500 at a rate of 12 p.c.p.a. for 3 years. If the interest is compounded annually then how many rupees should he pay to clear his loan?

Answer : Principal = 12500/-, Rate = 12% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 12500\left(1 + \frac{12}{100}\right)_3$$

$A = 12500\ (1+ 0.12)^3$

$A = 12500\ (1.12)^3$

$A = 12500\ (1.404928)$

∴ A = 17561.60/-

∴ Sameerao has to pay an amount of 17561.60/- .

Q. 3. To start a business Shalaka has taken a loan of ₹ 8000 at a rate of $10\frac{1}{2}$ p.c.p.a. After two years how much compound interest will she have to pay?

Answer : Principal = 8000/-, Rate = 10.5% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 8000\left(1 + \frac{10.5}{100}\right)^2$$

$A = 8000\ (1+0.105)^2$

$A = 8000\ (1.105)^2$

$A = 8000\ (1.221025)$

∴ A = 9768.2/-

∵ C.I. = A - P

∴ C.I. = 9768.2 - 8000

C.I. = 1768.2/-

∴ Shalaka has to pay a compound interest of 1768.2/- .

Practice set 14.2

Q. 1. On the construction work of a flyover bridge there were 320 workers initially. The number of workers were increased by 25% every year. Find the number of workers after 2 years.

Answer : Present number of workers = 320 workers, Rate (increase) = 25% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 320\left(1+\frac{25}{100}\right)^2$$

$A = 320\ (1+0.25)^2$

$A = 320\ (1.25)^2$

$A = 320\ (1.5625)$

$\therefore A = 500/-$

∴ The number of workers after 2 years will be 500.

Q. 2. A shepherd has 200 sheep with him. Find the number of sheeps with him after 3 years if the increase in number of sheeps is 8% every year.

Answer : Present number of sheeps (P) = 200 sheeps, Rate = 8% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 200\left(1+\frac{8}{100}\right)^3$$

$A = 200\ (1+0.08)^3$

$A = 200\ (1.08)^3$

$A = 200\ (1.259712)$

$\therefore A = 251.9424$

A = 252 sheeps (Rounded off)

∴ The number of sheeps after 3 years is 252.

Q. 3. In a forest there are 40,000 trees. Find the expected number of trees after 3 years if the objective is to increase the number at the rate 5% per year.

Answer : Present Trees (P) = 40000 trees, Rate = 5% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 40000\left(1+\frac{5}{100}\right)^3$$

$A = 40000\ (1+0.05)^3$

$A = 40000\ (1.05)^3$

$A = 40000\ (1.157625)$

∴A= 46305/-

∴ The expected number of trees after 3 years will be 46305.

Q. 4. The cost price of a machine is 2,50,000. If the rate of depreciation is 10% per year find the depreciation in price of the machine after two years.

Answer : Principal = 250000/-, Rate (decrement) = 10% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore A = 250000\left(1+\frac{-10}{100}\right)^2$$

$$A = 250000\left(1-\frac{10}{100}\right)^2$$

$A = 250000\ (1\text{-}0.1)^2$

$A = 250000\ (0.9)^2$

$A = 250000\ (0.81)$

$\therefore$ A= 202500/-

$\because$ C.I. = A - P

$\therefore$ Depreciation in Price (C.I.) = 202500 – 250000

Depreciation in Price (C.I.) = -47500/-

(-) sign denotes the depreciation in amount.

$\therefore$ Depreciation in Price of the machine after 2 years will be 47500/- .

Q. 5. Find the compound interest if the amount of a certain principal after two years is
₹ 4036.80 at the rate of 16 p.c.p.a.

Answer : Amount= 4036.80/-, Rate = 16% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1+\frac{R}{100}\right)^n$$

$$\therefore 4036.80 = P\left(1+\frac{16}{100}\right)^2$$

$4036.80 = P\ (1+0.16)^2$

$4036.80 = P\ (1.16)^2$

$4036.80 = P\ (1.3456)$

$\therefore$ P = 3000/-

∵ C.I. = A - P

∴ C.I. = 4036.80 - 3000

C.I. = 1036.80/-

∴ Compound interest is 1036.80/- .

Q. 6. A loan of ₹ 15000 was taken on compound interest. If the rate of compound interest is 12 p.c.p.a. find the amount to settle the loan after 3 years.

Answer : Principal = 15000/-, Rate = 12% (p.c.p.a), Duration (n) = 3 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 15000\left(1 + \frac{12}{100}\right)_3$$

$A = 15000\ (1+0.12)^3$

$A = 15000\ (1.12)^3$

A = 15000 (1.404928)

∴ A= 21073.92/-

∴ Amount to settle the loan after 3 years is 21073.92/- .

Q. 7. A principal amounts to ₹ 13924 in 2 years by compound interest at 18 p.c.p.a. Find the principal.

Answer : Amount= 13924/-, Rate = 18% (p.c.p.a), Duration (n) = 2 years

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 13924 = P\left(1 + \frac{18}{100}\right)_2$$

$13924 = P\ (1+0.18)^2$

$13924 = P\ (1.18)^2$

13924 = P (1.3924)

∴ A = 10000/-

∴ The principal is 10000/- .

Q. 8. The population of a suburb is 16000. Find the rate of increase in the population if the population after two years is 17640.

Answer : Present Population (P) = 16000/-, Rate = R% (p.c.p.a), Duration (n) = 2 years

Population after 2 years (A) =17640/-

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 17640 = 16000\left(1 + \frac{R}{100}\right)_2$$

$$\frac{17640}{16000} = 1 + \frac{R}{100}$$

$$\frac{17640}{16000} - 1 = \frac{R}{100}$$

$$\frac{R}{100} = \frac{1640}{16000}$$

∴ R = 5%

∴ The population of that suburb will increase at the rate of 5%.

Q. 9. In how many years ₹ 700 will amount to ₹ 847 at a compound interest rate of 10 p.c.p.a.

Answer : Principal = 700/-, Rate = 10% (p.c.p.a), Duration (n) = n years Amount = 847/-

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore 847 = 700\left(1 + \frac{10}{100}\right)^n$$

$$\frac{847}{700} = \left(1 + \frac{10}{100}\right)^n$$

1.21 = $(1 + 0.1)^n$

1.21 = $(1.1)^n$

∴ n = 2 years

∴ The number of years required to gain an amount of 847/- from a principal of 700/- is 2.

Q. 10. Find the difference between simple interest and compound interest on ₹ 20000 at 8 p.c.p.a.

Answer : Principal = 20000/-, Rate = 8% (p.c.p.a), Duration (n) = n years

∵ For the first year, compound interest and simple interest will be same, so it will vary from second year, therefore assuming the duration as 2 years in the same case.

$$\because A = P\left(1 + \frac{R}{100}\right)^n$$

$$\therefore A = 20000\left(1 + \frac{8}{100}\right)^2$$

A = 20000 $(1+0.08)^2$

A = 20000 $(1.08)^2$

A = 20000 (1.1664)

∴ A = 23328/-

∵ C.I. = A - P

C.I. = 23328 – 20000

∴ C.I. = 3328/-

$$\because S.I. = \frac{P \times R \times n}{100}$$

$$\therefore S.I. = \frac{20000 \times 8 \times 2}{100}$$

S.I. = 3200/-

∴ Difference = C.I. – S.I.

Difference = 3328 – 3200

Difference = 128 /-

∴ The difference between simple interest and compound interest is 128/- .